MULTIPARAMETRIC ASSESSMENT OF AMBIENT AIR PM IMPACT ON RESPIRATORY HEALTH

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Background and aims: The present study aims at examining the relationship between green areas and health in four EU cities, investigated the association between air pollution, meteorological conditions and daily respiratory hospitalization for the population of Athens (Greece) from 2003 to 2005.
Methods: To this aim we applied two different statistical approaches: one that makes use of General Linearized Models (GLM) and one based on Artificial Neural Networks (ANN). For both we used time series data for the followings covariates: ozone, PM10, nitrogen dioxide sulphur dioxide, carbon monoxide, temperature, humidity wind speed, wind direction and a dummy variable to account for the seasonality.
Results: Results showed that both models performed adequately with consistent outcomes: PM is the dominant parameter related to hospital admissions, followed by O_3 and the other atmospheric pollutants (CO, NO_2 and SO_2). Meteorological parameters also play a decisive role in the formation of air pollutant levels affecting public health. ANN, in particular, gave a higher contribution to the meteorological parameters, capturing more efficiently the combined effect of chemical (air pollution) and physical (temperature and humidity) stressors on health outcome and so showing a better adaptation in complicate environmental issues results in improved modelling predictions compared to the GLMs.
Conclusions: A major finding of the study regards the flexibility and the adaptation of the methodological approach for assessing non-linear problems and specifically the effect of non-linear parameters, such as air temperature. Thus, the mathematical tool we developed successfully captures the direct impact of the meteorological parameters (temperature and humidity) to health outcomes. Besides the assessment of the significance of the environmental stressors affecting hospital admissions, the ANN approach demonstrated its higher capacity in predicting days with higher morbidity risk. This feature of the model makes it a valid policy-maker tool to support decisions on preventive measures.